

Claims

1. A three dimensional printing composition, comprising:

5 about 10% to about 50% by weight of an adhesive material;
 0% to about 20% by weight of a first fibrous component; and
 0% to about 80% by weight of a filler.

2. The three dimensional printing composition of claim 1, further comprising from about 0% to about 30 % of a second fibrous component.

10 3. The three dimensional printing composition of claim 1, further comprising about 0 to about 3 percent, by weight of the total composition, of a printing aid.

15 4. The three dimensional printing composition of claim 3, wherein the printing aid is selected from the group consisting: of lecithin, hydrophilic lecithin, polypropylene glycol, citronellol, and combinations thereof.

5. The three dimensional printing composition of claim 1, wherein the filler has a mean particle size between about 20 and about 200 microns.

20 6. The three dimensional printing composition of claim 5, wherein the adhesive material has an average particle grain size between about 10 and about 20 microns.

25 7. The three dimensional printing composition of claim 1, wherein the adhesive material is a polymer.

8. The three dimensional printing composition of claim 1, wherein the filler is a polymer.

9. The three dimensional printing composition of claim 7, wherein the adhesive material is 30 water –soluble.

10. The three dimensional printing composition of claim 7 or 8, wherein the polymer is selected from the group consisting of polyethylene glycol, sodium polyacrylate, polyvinyl alcohol, polyvinyl pyrrolidone, sodium polyacrylate copolymer with maleic acid, polyvinyl pyrrolidone copolymer with vinyl acetate, and combinations thereof.

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11. The three dimensional printing composition of claim 9, wherein the adhesive material is a carbohydrate.

12. The three dimensional printing composition of claim 1, wherein the filler is a

10 carbohydrate.

13. The three dimensional printing composition of claim 11 or 12, wherein the carbohydrate is selected from the group consisting of acacia gum, locust bean gum, sodium carboxy methylcellulose, sodium alginate, hydroxypropyl cellulose, dextrin, maltodextrin, cellulose 15 gel, starch, sugar, and combinations thereof.

14. The three dimensional printing composition of claim 11 or 12, wherein the carbohydrate is a starch selected from the group consisting of: pregelatinized starch, acid-modified starch, and hydrolyzed starch.

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15. The three dimensional printing composition of claim 11 or 12, wherein the carbohydrate is a sugar or a sugar alcohol selected from the group consisting of sucrose, dextrose, fructose, lactose, polydextrose, sorbitol, xylitol, and combinations thereof.

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16. The three dimensional printing composition of claim 1, wherein adhesive material is a protein.

17. The three dimensional printing composition of claim 1, wherein the filler is a protein.

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18. The three dimensional printing composition of claim 1, wherein adhesive material is an organic acid.

19. The three dimensional printing composition of claim 1, wherein filler is an organic acid.

20. The three dimensional printing composition of claim 16 or 17, wherein the protein is selected from the group consisting of: gelatin, rabbit-skin glue, soy protein, urea, and combinations thereof.

5 21. The three dimensional printing composition of claim 18 or 19, wherein the organic acid is selected from the group consisting of citric acid, succinic acid, polyacrylic acid, and combinations thereof.

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22. The three dimensional printing composition of claim 1, wherein the adhesive material is an inorganic compound.

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23. The three dimensional printing composition of claim 1, wherein the filler is an inorganic compound.

24. The three dimensional printing composition of claim 22 or 23, wherein the inorganic compound is selected from the group consisting of plaster, bentonite, sodium silicate, salt, and combinations thereof.

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25. The three dimensional printing composition of claim 1, wherein the filler is plaster.

26. The three dimensional printing composition of claim 1, wherein the fibrous component has a length of about 60 microns to about 200 microns.

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27. The three dimensional printing composition of claim 26, wherein the fibrous component is a polymeric fiber.

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28. The three dimensional printing composition of claim 27, wherein the polymeric fiber is selected from the group consisting of: cellulose fiber, cellulose derivative fiber, ceramic fiber, graphite fiber, and fiberglass.

29. The three dimensional printing composition of claim 26, wherein the fibrous component is selected from the group consisting of : cellulose fiber, silicon carbide fiber, graphite fiber, aluminosilicate fiber, polypropylene fiber and fiberglass.

5 30. The three dimensional printing composition of claim 2, wherein the second fibrous component has a length of about 30 microns to about 100 microns.

31. The three dimensional printing composition of claim 6, wherein the adhesive material is a polyvinyl pyrrolidone copolymer with vinyl acetate.

10 32. The three dimensional printing composition of claim 5, wherein the filler is a polyvinyl pyrrolidone copolymer with vinyl acetate.

15 33. The three dimensional printing composition of claim 1, wherein the adhesive material is about 30 percent, by weight, of the composition.

34. The three dimensional printing composition of claim 1, wherein the filler is about 60 percent, by weight, of the composition.

20 35. The three dimensional printing composition of claim 33, wherein the filler is up to about 30 percent, by weight, of the composition.

36. The three dimensional printing composition of claim 1, wherein the first fibrous component is about 10 percent, by weight, of the composition.

25 37. The three dimensional printing composition of claim 2, wherein the second fibrous component has a length less than half the length of the first fibrous component.

38. A method of three dimensional printing, comprising:

30 providing a three dimensional printing composition comprising a particulate material having about 10% to about 50% by weight of an adhesive material; 0% to about 20% by weight of a first fibrous component; and

0% to about 80% by weight of a filler; and
providing instructions for using the three dimensional printing composition.

39. A three dimensional printing composition, comprising:

5 a particulate material having a mean particle size between about 10 microns and about
300 microns; and
a soluble adhesive material,
wherein the adhesive material is up to about 50 percent, by weight, of the
composition.

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40. The three dimensional printing composition of claim 39, further comprising a filler.

41. The three dimensional printing composition of claim 40, wherein the filler is a
carbohydrate.

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42. The three dimensional printing composition of claim 39, further comprising a printing
aid.

20 43. The three dimensional printing composition of claim 42, wherein the printing aid is
selected from the group consisting of: polyethylene glycol, sorbitan trioleate, sorbitan mono-
oleate, ethlyene glycol di-octyl-decyl ester, and ethoxylated fatty-acid esters of sorbitan,
glycerol, ethylene glycol and propylene glycol, of lecithin, hydrophilic lecithin,
polypropylene glycol, citronellol, and combinations thereof.

25 44. The three dimensional printing composition of claim 39, wherein the adhesive is a starch.

45. The three dimensional printing composition of claim 40, wherein the filler is a starch.

30 46. The three dimensional printing composition of claim 44 or 45, wherein the starch is
selected from the group consisting of: pregelatinized starch, acid-modified starch, cationically
modified starch, and hydrolyzed starch, and combinations thereof.

47. The three dimensional printing composition of claim 44, further comprising a fiber.

48. The three dimensional printing composition of claim 47, wherein the fiber is selected from the group consisting of: polymeric fiber, rayon fiber, ceramic fiber, graphite fiber, and 5 fiberglass, and combinations thereof.

49. The three dimensional printing composition of claim 48, wherein the polymeric fiber is selected from the group consisting of: cellulose fiber, cellulose derivative fiber, alkyl or alkene monomers of up to 8 carbon atoms.

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50. A three dimensional printing composition, comprising:

a particulate material including plaster;

a first adhesive;

a second adhesive; and

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an accelerator.

51. The three dimensional printing composition of claim 50, further comprising a filler.

52. The three dimensional printing composition of claim 51, wherein the filler is selected 20 from the group consisting of: silica, limestone, starch, terra alba, and combinations thereof.

53. The three dimensional printing composition of claim 50, wherein the accelerator is selected from the group consisting of: terra alba, potassium sulfate, sodium chloride, undercalcined plaster, alum, potassium alum, lime, calcined lime, and combinations thereof.

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54. The three dimensional printing composition of claim 50, further comprising a retarder.

55. The three dimensional printing composition of claim 54, wherein the retarder is selected from the group consisting of: Borax, marshmallow root, alcohol, sugar, sorghum, potassium 30 acid tartrate, powdered horn, hair, citric acid, acetic acid, and combinations thereof.

56. The three dimensional printing composition of claim 50, wherein the first adhesive is

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partially hydrolyzed poly vinyl alcohol.

57. The three dimensional printing composition of claim 56, wherein the second adhesive is Dextrin.

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58. The three dimensional printing composition of claim 50, wherein the first adhesive is Dextrin.

59. The three dimensional printing composition of claim 56, wherein the second adhesive is

10 Cellulose gel.

60. The three dimensional printing composition of claim 50, wherein the composition includes less than about 20 % of the accelerator by weight of the composition.

15 61. The three dimensional printing composition of claim 60, wherein the composition includes less than about 5 % of the accelerator by weight of the composition.

62. The three dimensional printing composition of claim 61, wherein the composition includes less than about 1 % of the accelerator by weight of the composition.

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63. The three dimensional printing composition of claim 50, wherein the composition includes about 60 to about 80 % of plaster, by weight of the composition.

64. The three dimensional printing composition of claim 63, wherein the composition

25 includes about 15 to about 30% of the first adhesive, by weight of the composition.

65. The three dimensional printing composition of claim 64, wherein the composition includes about 2 to about 10% of the second adhesive, by weight of the composition.

30 66. A kit for three dimensional printing, comprising:

 a three dimensional printing composition; and
 an aqueous fluid,

wherein the three dimensional printing composition comprises a particulate material including plaster and a first adhesive.

67. The kit of claim 66, wherein the three dimensional printing composition further includes

5 a second adhesive.

68. The kit of claim 67, wherein the three dimensional printing composition further

comprises an accelerator.

10 69. The kit of claim 67, wherein the aqueous fluid comprises an accelerator.

70. The kit of claim 69, wherein the aqueous fluid further comprises a humectant.

71. The kit of claim 70, wherein the aqueous fluid further comprises flow rate enhancer.

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72. A three dimensional printing composition, comprising:

a particulate material including plaster,

an adhesive;

an accelerator; and

20 a filler.

73. The three dimensional printing composition of claim 72, wherein the filler is selected

from the group consisting of: silica, limestone, starch, terra alba, plaster, glass beads, sand,

rayon fiber, cellulose, limestone, zircon, olivine, staurolite, chromite, alumina, mullite,

25 bohemite, kaolin, bentonite, and combinations thereof.

74. The three dimensional printing composition of claim 72, wherein the accelerator is

selected from the group consisting of: terra alba, undercalcined plaster, alum, potassium

alum, lime, calcined lime, barium sulfate, magnesium sulfate, zinc sulfate, calcium chloride,

30 potassium sulfate, sodium sulfate, ammonium sulfate, calcium formate, calcium nitrate,

sodium silicate, potassium chloride, sodium chloride, ammonium chloride, and combinations

thereof.

75. The three dimensional printing composition of claim 72, further comprising an oil.
76. The three dimensional printing composition of claim 75, wherein the oil is selected from the group consisting of: oleoyl alcohol, dodecyl alcohol, other aliphatic alcohols, polypropylene glycol, polyethylene glycol, ethers of polyethylene glycol, ethers of polypropylene glycol, mineral oil, fatty esters such as methyl oleate, ethylene glycol octyl/decyl ester; and glycerol tributyrate, all of the above plus lodyne.